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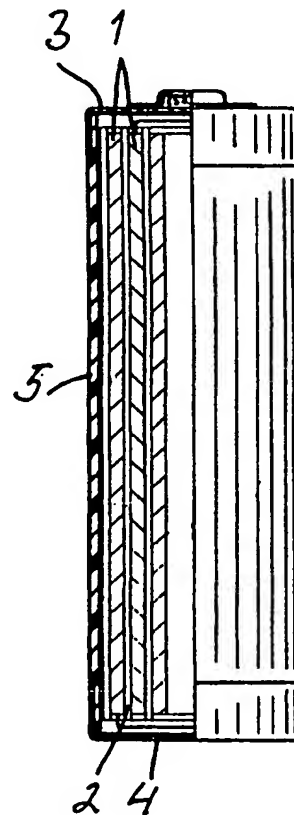
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In English translation (filed in Swedish).

(54) Title: CONTAINER FOR A BATTERY CELL

(57) Abstract

A container for a closed, rechargeable battery cell comprises a cylindrical tube (5) of a thermoplastic material provided with two end-closing lids (3, 4) of an electrically conducting material. The lids are arranged at the outside of the ends of the tube.



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## Container for a battery cell

### Technical field

The present invention relates to a container for a closed, rechargeable battery cell, comprising a cylindrical tube of a thermoplastic material provided with two end-closing lids of an electrically conducting material.

### Background of the Invention

A container of the type as defined above is disclosed in WO-A-97/11500. In said construction the lids consist of disks, preferably made of steel, mounted into the ends of the tube with flange constructions and the like in order to accomplish a tight sealing. The tube has a smooth exterior surface but can have different kinds of inner shape in order to accomplish the desired tightness.

Various loads on the container, such as interior overpressure and heat, give a greater expansion of the plastic tube than of the metal lid. Thus, an increased load results in an increased risk for leakage.

The object of the present invention is to avoid the drawback with an increased risk for leakage at an increased load without decreasing other advantageous properties.

### The Invention

According to the invention this is accomplished by forming the lids like cups arranged at the outside of the ends of the tube.

This means that with an interior load, with a resulting greater expansion of the tube, the tube will be pressed to an ever increasing extent against the lids with a resulting improved tightness.

A further advantage of external lids is that the tube gets an entirely smooth inner side and that the available internal space increases so there will be more room for active material.

If the tube at the ends has shoulders with an outer diameter corresponding to the inner diameter of the lids, and the outer diameter of the lids corresponds to the outer diameter of the tube, a container is accomplished, which has a principally smooth exterior with resulting functional and aesthetical advantages.

A further improved assembly between the tube and the lids can be accomplished if there is locking means in the form of a locking ring between each lid and the end of the tube.

### The Drawing

The invention will be further described below with reference to the appended drawing, in which Fig 1 is a partly sectioned side view of a battery, cell with an end-closing according to the invention, Fig 2 is a cross sectional view to a larger

scale of the lower part of Fig 1, Fig 3 is a sectional view according to Fig 1 of a first alternative embodiment and Fig 4 is a sectional view according to Fig 2 of a second embodiment.

### Detailed description of a preferred embodiment

A closed cylindrical battery cell, preferably a nickel-metal hydride battery, is disclosed in WO-A-97/11500, to which reference is made for a more detailed background description.

Regarding the content of the battery cell in the present case, it will probably be sufficient to point out that there are electrodes 1, separated by a separator 2, and a suitable electrolyte.

The electrodes are in electrical contact with an upper lid and with a lower lid (i.e. a bottom), both made of an electrical conducting metal material.

The lids 3 and 4 form together with a cylindrical tube 5 the container of the battery cell. The cylindrical tube 5 is manufactured from a plastic material, preferably a thermoplastic material, such as polypropylene. As is clear from Fig 2, the tube has a constant inner diameter all over its length.

The lids 3 and 4, for instance made of stainless or nickel plated steel, are formed like cups or caps and can be deep-drawn. They are intended to be slipped on to the ends of tube 5, which for this purpose can have shoulders with smaller diameter and a length corresponding to the depth of the cups. The external diameter of the shoulder corresponds to the internal diameter of the cups, while the external diameter of the cups corresponds to the external diameter<sup>e</sup> of tube 5, so

that a smooth passage is formed between the lids 3 and 4 and tube 5.

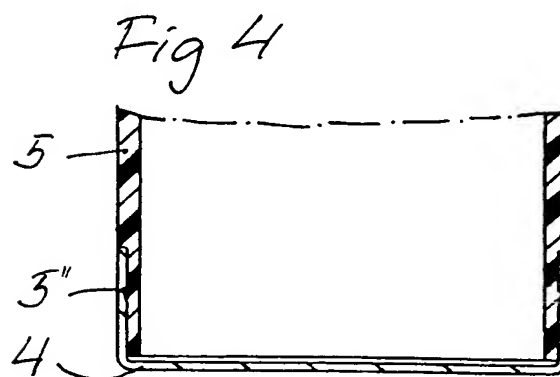
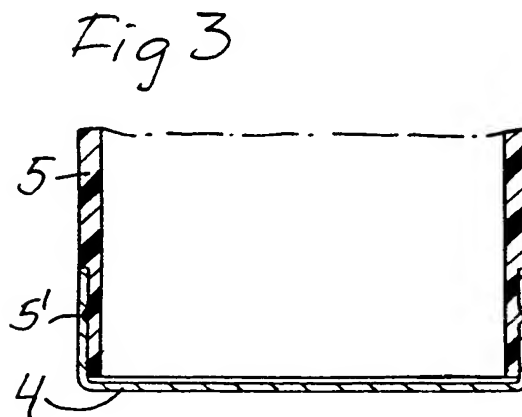
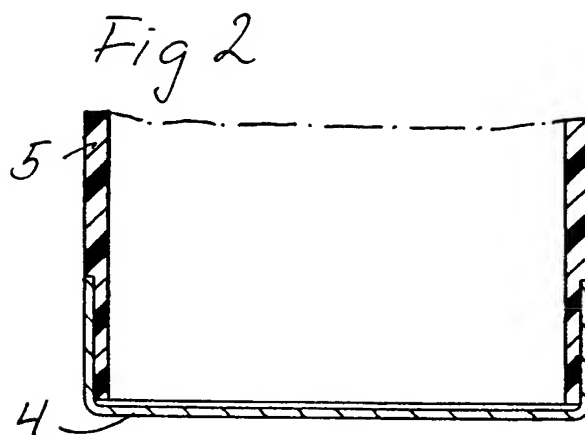
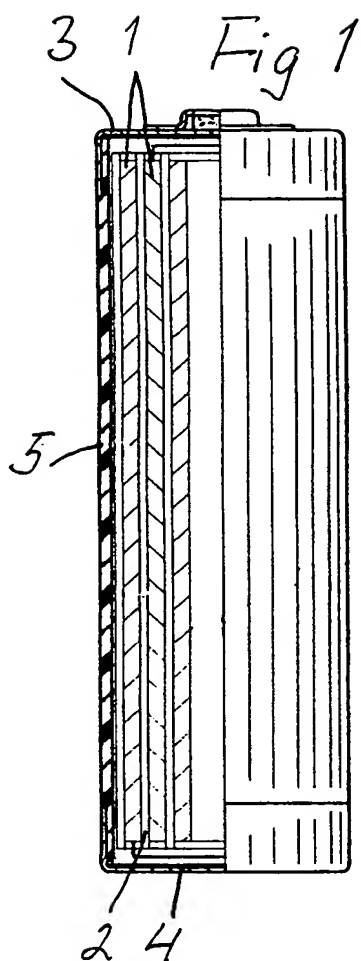
The assembly of the battery cell can be made in the following way: A suitable glue which can have the two aims of both tightening and joining and which can resist the electrolyte of the battery, is applied on the lower shoulder of tube 5 and in the lower lid , after which it is pressed on to the tube.

A suitable cylindrical electrode coil, comprising electrodes 1 and separator 2, is inserted in the tube until electrical contact with the lower lid 4. Electrolyte is filled up, after which the upper lid 3 is mounted in the same way as the lower lid 4 and is brought in electrical contact with the electrode coil.

At an increasing internal pressure in the container the lids 3 and 4 are subjected to axial forces. To better withstand these forces one can, instead of the smooth engagement surface between the lids 3 and 4 and the shoulders of tube 5 according to figure 1 and 2, arrange snap-in closure locking means in the form of a gently curved locking ring 5' (fig 3) or a sharp-edged locking ring 5'' (fig 4) with corresponding ring-shaped grooves in the respective lids 3 and 4.

## Claims

1. A container for a closed, rechargeable battery cell, comprising a cylindrical tube (5) of a thermoplastic material provided with two end-closing lids of an electrically conducting material, characterized in that the lids (3,4) are formed like cups, arranged at the outside of the ends of the tube (5).
2. A container according to claim 1, characterized in that the tube at the ends has shoulders with an external diameter corresponding to the internal diameter of lids and that the external diameter of the lids corresponds to the external diameter of the tube.
3. A container according to claim 1, characterized in that between each lid (3,4) and the end of the tube (5) locking means are arranged in the form of a locking ring (5',5'').





## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 98/02341

<b>A. CLASSIFICATION OF SUBJECT MATTER</b>		
<b>IPC6: H01M 2/02</b> According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b>		
Minimum documentation searched (classification system followed by classification symbols)		
<b>IPC6: H01M</b>		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
<b>SE,DK,FI,NO classes as above</b>		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 9711500 A1 (NI-ME HYDRID AB), 27 March 1997 (27.03.97), page 4, line 13 - line 34; page 6, line 21 - line 28  --	1-3
Y	WO 9504380 A1 (CHRISTOPH EMMERICH GMBH & CO. KG), 9 February 1995 (09.02.95), page 7, line 22 - page 8, line 17  --	1-3
Y	US 5512385 A (KATSUNORI KOMORI ET AL), 30 April 1996 (30.04.96), column 17, line 30 - line 53  -- -----	1-3
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Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9711500 A1	27/03/97	AU 3862495 A EP 0871980 A SE 9501064 D	09/04/97 21/10/98 00/00/00
WO 9504380 A1	09/02/95	AT 146901 T AT 150905 T AU 7182494 A AU 7225794 A CA 2168100 A CA 2168101 A CN 1128083 A CN 1128084 A DE 4325464 A DE 59401425 D DE 59402248 D DK 711459 T DK 711460 T EP 0711459 A,B SE 0711459 T3 EP 0711460 A,B SE 0711460 T3 ES 2098971 T ES 2100725 T FI 960372 A FI 960373 A GR 3022958 T GR 3023334 T JP 9501005 T JP 9501006 T NO 960213 A NO 960214 A US 5783329 A US 5789096 A WO 9504381 A	15/01/97 15/04/97 28/02/95 28/02/95 09/02/95 09/02/95 31/07/96 31/07/96 02/02/95 00/00/00 00/00/00 23/06/97 25/08/97 15/05/96  15/05/96  01/05/97 16/06/97 26/01/96 26/01/96 30/06/97 29/08/97 28/01/97 28/01/97 12/03/96 12/03/96 21/07/98 04/08/98 09/02/95
US 5512385 A	30/04/96	JP 7286225 A	31/10/95